

Climate Change: What It Means for Us, Our Children, and Our Grandchildren

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By [J. F. C. DiMento](#), [P. Doughman](#) and [S. Levesque](#)

Most of us are familiar with the terms climate change and global warming, but not too many of us understand the science behind them. Below, Joseph F. C. DiMento, Pamela Doughman, and Suzanne Levesque discuss the scientific knowledge about global climate change, describe how it will affect all of us, and suggest how government, businesses, and citizens can take action against it.

Climate change is a complex challenge, perhaps one of the largest the world has ever faced. It poses challenges for local, national, and international governments and the private sector. Further changes in average temperature, precipitation, and weather events will affect human health and global and regional economies. Ecosystems will change, and some species will be made extinct. Many ice sheets will melt or shrink, many glaciers will recede or disappear, and oceans will continue to rise.

Climate change will be different across regions. Agriculture will be more productive in some zones and jeopardized in others. Changes in weather, water availability, crop yields, heat waves, and public health — and the associated demands for energy — will be significant in some places at even small temperature increases. At the high level of 5.8°C (10.5°F), the impacts will be severe.

There exists an impressive record of climate change research, from the work of individual laboratories and the compilations and assessments of existing knowledge by the Intergovernmental Panel on Climate Change (IPCC) and other major scientific bodies. Even so, there continues to be a mistaken view among some of the public that 1) there is no consensus on whether climate change exists; and 2) some scientists have self-interested reasons for viewing the situation with alarm.

Climate scientists — like scientific experts in other disciplines — do not always have expertise when it comes to communicating their findings to the public. Nonetheless, no matter what some people believe and contrarians assert, the reality of climate change and its effects stands up well to the generally accepted standards of scientific inquiry. Denying that global warming is real is simply a refusal to look at the evidence.

The localized effects of climate change will vary. Not everyone will be hurt, and some will likely benefit. But, some regions are extremely vulnerable to ongoing changes in climate, and their populations, their resources, and their environments will be damaged in significant ways. Effects in the truly poorest communities may well be felt worldwide through the economic networks that have evolved in a globalized world.

Changing Knowledge

Our understandings of the challenges, risks, and opportunities of climate change evolve daily as new scientific information becomes available for society to consider. Abrupt climate change has moved from

science fiction to a subject of serious attention. Through nongovernmental organizations, businesses, governments, and international communities, societies across the world are learning more and more about climate change. Rather than wait for greater certainty, many are moving forward at the local, state, and regional levels to reduce greenhouse gas emissions and strengthen resiliency to climate change, but more progress is needed. Overall, emissions from countries with Kyoto targets fell significantly, but global emissions have increased in the Kyoto target period. Writing in 2009, Ackerman notes, "If all of the US matched the performance of California and New York, the result would be a reduction of 40 percent of US emissions, or 8 percent of global emissions."¹

In addition, opportunities to reduce greenhouse gas emissions on a voluntary basis are widely available. For example, there is a large market for voluntary greenhouse gas emission offsets. Tax credits and incentives encourage businesses and individuals to increase energy efficiency and use renewable energy.

New ideas are encouraged through competitions such as the Solar Decathlon, sponsored by the US Department of Energy. The MIT Center for Collective Intelligence has developed a project called Climate CoLab, which encourages individuals to contribute ideas to reduce greenhouse gas emissions and increase resiliency to climate change.

The Economics of Climate Change and Risk Assessment

Although we need more information to fully understand the actual costs and benefits of meaningful responses to climate change, the benefits of reducing emissions without delay outweigh the costs. An expert in economic assessment of climate change finds that waiting fifty years to reduce carbon dioxide (CO₂) emissions would create a loss estimated to be \$6.5 trillion.²

There are different risks for different regions. The weakest and poorest communities will feel the harm most. But here there is another complicating factor: serious effects across regions — from migration, from movement of environmental health problems, and from the potential for political unrest that is linked to serious environmental degradation.

The meaning of climate change for us, our children, and our grandchildren will be influenced by whether we make investments today to reduce the amount of sea level rise, the frequency and severity of extreme weather events, the magnitude of environmental health challenges, and the strains on international relations for future generations. Some economic assessments of climate-change policies rely on cost-benefit analysis.

The Function and Complexity of Cost-Benefit Analysis

For decades, economists have tried to assist policymakers in decisions by conducting cost-benefit analyses of proposed actions. The area of climate change is no exception.

To develop cost-benefit analyses for climate change, scientists and economists estimate socioeconomic costs of a range of environmental impacts predicted by climate models (computer simulations). This provides an estimate of whether the benefits of a proposed mitigation or adaptation measure exceed the economic costs for the conditions, scenarios, impacts, and discount rate assumed in the study.

For example, the cost of Hurricane Sandy could reach \$50 billion, which may be five times greater than the annual costs of the most costly environmental regulations. Hurricane Katrina's costs were even higher: that storm resulted in an estimated \$81 billion in damages or approximately eight times more than the yearly

cost of the costliest environmental regulations. These types of comparisons help to clarify the economic costs of failing to act.

What climate change means for you, your children, and your grandchildren depends on which generation you are considering, on where you live, and on how you value the risks and rewards of reducing greenhouse gas emissions.

Some costs are becoming more clear as we experience (rather than simply wonder about) climate change. In agriculture, there will be increased costs (and, in places, benefits) associated with shifts in the type of crop cultivated and the water available for those crops. Industry, whether carbon dioxide is regulated directly or not, will need to pay for ground-level ozone noncompliance through stricter pollution controls or fines. Climate change is expected to increase ground-level ozone. A less healthy workforce (with increased asthma and other respiratory and heat-related illnesses) will take more sick days, decrease business productivity, and require higher health premiums. Higher temperatures will increase energy use. Forest fires will be more frequent and more severe.

Closing Thoughts

What climate change means for you, your children, and your grandchildren depends on which generation you are considering, on where you live, and on how you value the risks and rewards of reducing greenhouse gas emissions. But it also depends on the actions that are taken by international organizations, nations, states and municipalities, regions and provinces, and businesses that directly influence climate policy. Citizens can also play a role in helping to mitigate and respond to climate change at home, in business, and through participation in government processes. Policymakers increasingly include climate change in their view of the world. Climate change is becoming part of the calculus on whether to switch to a low-carbon automobile fleet or personal car, to insure or refuse to insure, to invest in renewables or exploration of non-renewables, to minimize the environmental footprint of new homes or not (for those fortunate enough to have the choice): the list is almost as long as the sources of greenhouse gases.

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About the Authors

[Joseph F. C. DiMento](#) is Professor in the School of Law and former Director of the Newkirk Center for Science and Society at the University of California, Irvine. He is co-editor of [Climate Change: What It Means for Us, Our Children, and Our Grandchildren](#) (MIT Press).



[Pamela Doughman](#) is an Energy Specialist with the California Energy Commission. She is co-editor of [Climate Change: What It Means for Us, Our Children, and Our Grandchildren](#) (MIT Press). Pamela co-authored this article in an individual capacity and not as an employee of the California Energy Commission. The opinions, conclusions, and findings expressed in this article do not necessarily reflect the official position, policies, or opinions of the California Energy Commission or the State of California. The California Energy Commission has not reviewed or approved this article.



Suzanne Levesque received her Ph.D from the University of California, Irvine. She currently

works as a manuscript proofreader and editor. *Changing Lanes: Visions and Histories of Urban Freeways* (2012), authored by Joseph F. C. DiMento and Cliff Ellis, is among her recent endeavours.



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